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EXAMINER

GORDON, BRIAN R

ART UNIT PAPER NUMBER

1743

DATE MAILED: 06/16/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

15

Office Action Summary

Application No.

09/619,768

Applicant(s)

FUKUIZUMI ET AL.

Examiner

Brian R. Gordon

Art Unit

1743

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 March 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11, 13-38 and 41-43 is/are pending in the application.
- 4a) Of the above claim(s) 1-11 and 32-33 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 18 is/are allowed.
- 6) ☒ Claim(s) 13-17, 19-31, 34-38 and 41-43 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Applicant's election of Group II, claims 13-31 and 34-38 in the reply filed on March 18, 2005 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Claim Rejections - 35 USC § 112

2. Claims 13-17, 19-31, and 34-38 rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claims 13, 24, and 29 basically recite the controller is programmed to simultaneously open the first, second, and third valves to continuously and simultaneously supply liquid and discharge gas and liquid. After a cursory review of the specification, the examiner fails to locate support for such a limitation. The summary of the invention mentions the simultaneous operation of the liquid discharge unit and gas discharge unit. However, this is not the same as the controller being programmed to control the three valves as specified. Applicant is invited to specifically point the examiner to exact location where support for such a limitation may be found in the specification. Claims 17 and 19 recite a similar limitation to that as addressed above. Claims 17 and 19 recite a controller for simultaneously operating the first, second, and third valves. It is unclear what the term "simultaneously

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operating” means. Does the term mean all of the valves are operated to same “open” or “closed” position at the same time or does the term mean one of the three valves may be open or closed while the two remaining valves are operated at the same time but to the opposite position of the one valve. Regardless of what applicant intends for the term to mean, the examiner fails to locate in the specification where all three valves are disclosed as being operated simultaneously by the controller. Applicant is invited to specifically point the examiner to exact location where support for such a limitation may be found in the specification.

Furthermore, it is unclear how the device can operate in a continuous manner without having a continuous supply of liquid. If the liquid were continuously discharged if no liquid supply is present then eventually all of the liquid initially present in the tank would be exhausted. The claims do specify a liquid chemical or water supply.

3. Claims 13-17, 19-31, and 34-38 rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for simultaneous operation of the liquid discharge unit and gas discharge unit, does not reasonably provide enablement for the controller being programmed to simultaneously operate the three valves to continuously and simultaneously discharge liquid and gas and supplying gas. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make or use the invention commensurate in scope with these claims.

Claim Interpretation

4. It is unclear what the term “simultaneously operating” means. For the purpose of examination the examiner interprets the term to mean all of the valves are operated to same “open” or “closed” position at the same time or terms mean one of the three valves may be open or closed while the two remaining valves are operated at the same time but to the opposite position of the one valve. A teaching of either would meet the limitation of claims 17 and 19.

Claim Rejections - 35 USC § 103

5. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

6. Claims 13-16, 23, 29, 34, 38, and 41-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ginsburgh et al. US 6,293,525.

Ginsburgh et al. disclose an apparatus for facilitating the mixing, absorption and/or retention of carbon dioxide ‘CO₂’ in hydrocarbon fuel to economically produce a safety-enhanced and/or improved-combustion fuel. The apparatus includes at least one mixing receptacle having at least one coupling with a controllable inert gas supply; at least one coupling with a controllable hydrocarbon fuel supply; and at least one coupling with a CO₂-enriched fuel fuel-line. The mixing receptacle(s) is configured to retain a volume of fuel and a volume of CO₂ such that CO₂-enriched fuel having a controllable gas-fuel ratio is the product of the mixing receptacle(s) and the gas of the ratio(s) exceeds 0.1 volume of CO₂ per volume of fuel and is less than approximately 3 volumes per volume of fuel when conveyed from the receptacle(s). The apparatus controls the

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exposure of hydrocarbon fuel molecules to an optimal volume of CO₂ within the receptacle(s). One embodiment of the invention includes the adaptation of the apparatus to existing fuel-burning devices, i.e. for retrofitting the apparatus thereto. The apparatus mixes and/or stores CO₂ in the fuel to achieve one or more of the following benefits: fuel receptacle safety-enhancement; improved engine combustion; reduction in undesirable emissions such as soot particulate; reduction in fuel droplet size; and/or, reduced fuel viscosity (abstract).

The reference also discloses an efficient and economical mixing apparatus 10 for exposing a controllable and/or optimal volume of inert gas such as CO₂ to a controllable and/or optimal volume of hydrocarbon fuel (e.g. Jet fuel, Diesel fuel, engine fuels, fuel oils and the like). The mixing apparatus 10 comprise at least one mixing receptacle 20 (preparation tank) suitable for the mixing of fuel 24 and inert gas 18 therein, with mixing receptacle 20 having at least one controllable fuel inlet/coupling means 32 to receive hydrocarbon fuel from a hydrocarbon fuel supply (storage tank) as directed by fuel control means 26, and at least one controllable gas inlet/coupling means 30 to receive inert gas such as CO₂ as directed by gas control means 28 from a controllable inert gas supply comprising one or more inert gas. Controllable inert gas inlet/coupling means 30 optionally includes the control means to determine fixed inert gas pressures, send pure inert gas through the mixing receptacle, and/or provide a variable range of inert gas pressures, including when appropriate, negative pressures. The device further comprises diffuser 40 (bubbler).

It is noted that fuel control means 26 can optionally be supplied by any one or more of a variety of fuel sources including fuels suppliable in various temperatures such as chilled fuel, and/or fuel otherwise optimized for inert gas absorption such as hydrocarbon fuel with additional light hydrocarbon atoms. Similarly, inert gas such as CO₂ can readily be stored in a chilled non-gaseous state e.g. liquid (cooling unit) or solid and used as an inert gas supply--including a gas supply that when expanding during phase conversion provides a naturally occurring positive pressure source.

Mixing receptacle 20 has one or more safety-enhanced or improved combustion fuel outlet/coupling means 36 (liquid discharge), which is connectable with an inert gas-enriched fuel distribution means such as outlet control means 46, to convey safety-enhanced fuel as needed. The control means 26, 28 and 46, (in respective pipes; see figures) are comprised of any one or more in a variety of known control device(s) such as automated, computer-controlled, or manually controlled, pump(s), **valve(s)**, recirculating device(s), manifold(s), and the like. Alternatively, the mixing receptacle(s) 20 can also comprise any one or more in a variety of known measuring and/or monitoring means 78, such as monitoring, measuring, reporting device(s) and/or instruments used to measure or regularly sample pressure, temperature, chemistry composition, gas concentration levels (concentration measurements), and the like, including the incorporation of monitoring means communication signal 80 with receptacle-content control means 82 (fuel control means 26, inert gas control means 28, and safety-enhanced fuel control means 46, inclusively) in order to facilitate the automation of optimal mixing of the inert gas in the hydrocarbon fuel. Communication signal 80 can be

transmitted through a suitable conduit connected between monitoring means 78 and any one or more of the control means, or alternatively can be transmitted by wireless transmission, in which case monitoring means 78 and any one or more of the control means are comprised of communicating transmitter(s) and receiver(s) respectively.

The reference does not specifically mention the computer-controlled valves are simultaneously operated.

However, it would have been obvious to one of ordinary skill in the art at the time of the invention to recognize the valves included within the control means may be operated simultaneously to control the mixing of the fuel to achieve the appropriate gas ratios.

7. Claims 13-15 and 23 rejected under 35 U.S.C. 103(a) as being unpatentable over Nakajima et al.

Nakajima et al. discloses a device that includes a container adapted to treat the substrate with the liquid chemical agent, the container having an inlet and an outlet; circulation means connecting the inlet and the outlet of the container, and having a circulation pump; a liquid reservoir; a gas supply; and a gas-liquid mixer for synthesizing the liquid chemical agent connected to the liquid reservoir and gas supply, and having an outlet for the liquid chemical agent connected to the circulation means. The device includes chemical concentration detection means disposed in the circulation means; and means for regulating the mixing ratio of the gas to the liquid connected to the Chemical concentration detection means and the mixer (concentration adjusting means).

The chemical concentration detection means may be a sensor for detecting a pH of the liquid chemical agent. Alternatively, the chemical concentration detection means includes a light source arranged to emit a light beam through the liquid chemical agent; means for detecting the intensity of the light beam passing through the liquid chemical agent; and means for correlating the intensity of the light beam detected with the concentration of a specific chemical in the liquid chemical agent.

The device comprises a pure water supply system 7 that includes a pure water supply 30 (preparation tank for storing a liquid) and pipe conduit 11 and gas supply system with conduits 41, 51; gas supply 40, 50; gas regulators 43,53. The device further comprises mixing unit 17 (dissolution unit), gas outlet 17d that has an electric motor operated valve 18 that is capable of controlling the discharge of undissolved gas, and liquid outlet 17d that comprises valve 19 (discharge control units).

A chemical concentration control routine may be executed by the ECU 73.

The control system regulates the rate of hydrogen chloride gas that is mixed with the pure water circulating through the circulation system to thereby control the concentration of hydrogen chloride in the liquid chemical agent. This process substantially keeps the concentration of hydrochloric acid at a constant level, and allows the uniform and high-quality cleaning of the substrates. The process of adding the gas into the circulated pure water does not cause an abrupt exothermic reaction, but applies heat for a gradual rise in the temperature of the processing liquid, thus effectively saving energy for the heating of the processing liquid.

Nakajima does not specify the ECU is programmed to simultaneously control the valves of the mixing unit.

However it would have been obvious to one of ordinary skill in the art at the time of the invention to recognize that the ECU may be programmed to simultaneously control the valves of the mixing unit in order to maintain the concentration of the hydrochloric acid at a constant level.

8. Claims 20-22, 30-31, and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakajima et al. as applied to claims 13-15, and 23 above, and in further in view of Sakamoto Naoki, JP 6-37080.

Nakajima et al. does not specifically recite that the device comprises an inclined nozzle to produce bubbles that contact a deflection plate.

Sakamoto discloses a device in which a line is used to bubbling a gas into a chemical solution for the fabrication of semiconductor wafers.

It is obvious that the line inserted in the chemical solution may be referred to as a nozzle. As to the inclination of the nozzle, which is a design modification that allows for the bubbles to contact a deflection plate in the vessel to control the flow of the bubbles upward through the liquid, the examiner hereby asserts that such a structure design is well known in the art for controlling the flow of fluid in a circulation tank. For example, in aeration systems it is well known to employ "baffles" (deflection plates) to control or divert the flow or circulation of fluid in the systems.

As to claim 31, it would have been obvious to one of ordinary skill in the art to purify the gas to be used in the fabrication process. For example, it is well known in the

art of manufacturing semiconductors via deposition processes (such as CVD) that purified gases (free of unwanted contaminants) are used.

As to claim 36, it would have been obvious to employ a common means such as a filter to separate the gas from the solution. The process of removing a gas from a liquid by using a filter that is permeable only to gas allows for the removal of bubbles or recycling of unused gas to maintain a system that operates at a high efficiency level.

Allowable Subject Matter

9. Claim 18 is allowed.

10. The following is an examiner's statement of reasons for allowance: The prior art does not teach nor fairly suggest a chemical solution preparation apparatus comprising a chemical solution refinement device, which dissolves a chemical gas into a liquid and prepares a refined chemical solution, wherein the liquid is one of pure water or a mixture having a predetermined composition, the chemical solution refinement device including; a preparation tank for storing the liquid, a gas supply line for supplying the chemical gas to the preparation tank; a liquid supply line for supplying the liquid to the preparation tank; a first valve arranged in the gas supply line for opening and closing the gas supply; a bubbler element connected to the gas supply line for forming bubbles of the chemical gas in the preparation tank to dissolve the chemical gas in the liquid; a gas discharge line for discharging an adjusted amount of the chemical gas that was not dissolved in the liquid from the preparation tank; a second valve arranged in the gas discharge line for opening and closing the gas discharge line; a chemical solution discharge line for discharging a predetermined amount of the chemical solution from the

preparation tank; a third valve arranged in the chemical solution discharge line for opening and closing the chemical solution discharge line; a cooling unit for cooling the liquid in the preparation tank, wherein the cooling unit includes a cooling element connected to the preparation tank and a pump for circulating the chemical solution between the preparation tank and the cooling element.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Response to Arguments

11. Applicant's arguments with respect to claims 13-17, 19-38 and 41-43 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Lu, Siqing et al.; Zesiger; Thierry; Seymour; Nathanael F.; Rosenberger; Roy R.; Burgert; Herwig; Gibney; Michael W. et al.; Klein; Richard G. et al.; Hauser; Erhard; Wilmer, Jeffrey Alexander et al.; and Lemke, Travis A. disclose gas mixing devices.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian R. Gordon whose telephone number is 571-272-1258. The examiner can normally be reached on M-F, with 2nd and 4th F off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill Warden can be reached on 571-272-1267. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read "E. P. M.", is positioned above the typed initials "brg".

brg